

4-th German Federal Mathematical Competition 1973/74

First Round

1. Find the necessary and sufficient condition that all convex quadrilaterals formed out of a given four-bar linkage are trapezoids.
2. Seven polygons of area 1 lie in the interior of a square with side length 2. Show that there are two of these polygons whose intersection has an area at least $1/7$.
3. For an n -element set M , let \mathcal{P} denote the family of all subsets of M . How many pairs (A, B) of subsets from \mathcal{P} are there such that A is a subset of B ?
4. All diagonals of a convex polygon are drawn. Prove that its sides and diagonals can be assigned arrows in such a way that no round trip along sides and diagonals is possible.